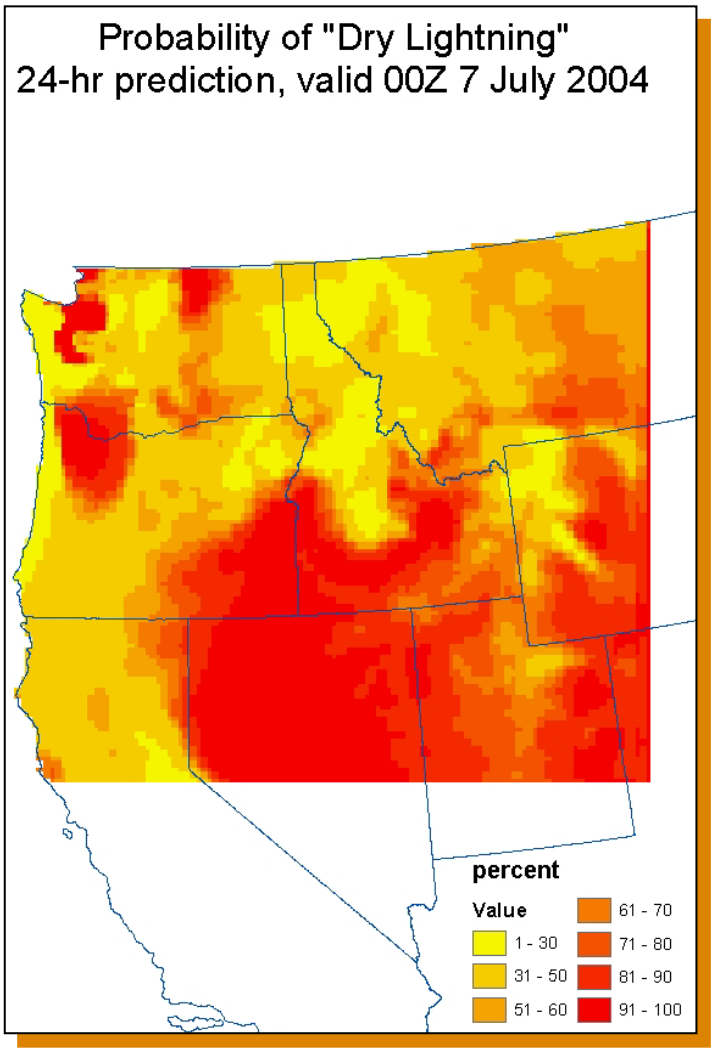
Joint Fire Science Program
FIREHouse
The Northwest and Alaska Fire Research Clearinghouse
www.fs.fed.us/pnw/fera/firehouse
Fire and Environmental Research Applications Team
Pacific Wildland Fire Sciences Laboratory

Predicting the Risk of "Dry" Lightning

Background



Lightning is a significant cause of wildfire in the United States. Whether or not an individual lightning strike results in an uncontrolled fire depends on many factors, including meteorological and fuel moisture conditions, and fire suppression efforts. It has long been recognized that fires are more likely to start and spread on days when conditions are dry and unstable. Nonetheless, until recently, no good methodology existed to identify which thunderstorms were more likely than others to cause fires. A previous study showed success in identifying dry, unstable days with a high risk of "dry" lightning (that which occurs without significant accompanying rainfall) in the Pacific Northwest. The method was successfully tested on the 2000 fire season, identifying days with the most lightning-caused fire starts as days with the greatest probability of dry lightning. These results can be adapted to other areas of the western U.S. to create a useful regional product.

The relationship between thunderstorms, lightning, and fire has been studied for many years, with the goal of providing better forecasts of fire risk on public and private lands. As early as the 1920s studies were undertaken to identify the synoptic weather conditions that result in large numbers of lightning-caused fires in the state of Washington. Later studies investigated the association between flash polarity and fire ignition, theorizing that lightning strikes that lower a positive charge to the ground are more likely to have a long continuing current, and therefore are more apt to cause ignition. Investigators also have tried to correlate synoptic weather patterns with thunderstorm activity and wildfire danger. The results of these previous studies indicate there is an important connection between atmospheric conditions and thunderstorms that ignite fires, but none have provided a simple methodology forecasters can use to assess the risk of dry thunderstorms.

In a previous study, a rule was developed to separate convective days into "dry" and "wet" categories and were able to assign a probability of dry lightning. This analysis was performed using data from Spokane, WA, and performed well when tested on independent data. Additionally, a significant difference in patterns was found over the eastern Pacific and western North America between and dry

and wet convective days. On dry days the trough was located west of the coastline, while on wet days the trough was situated over the Oregon and northern California coast. The mean heights were significantly higher on dry days than on wet days.

Research Objective

The objective of this work is to incorporate existing weather predictions into fire preparedness and planning by forecasting the risk of dry thunderstorms. This has been done by analyzing precipitation, upper-air, and lightning strike data to generate a rule that will be used to assess the risk of dry convection over the western U.S. The risk maps are available online (www.fs.fed.us/pnw/airfire/sf) and are easily interpreted by forecasters and land managers. The benefits of this project are two-fold. In the short term, this work leads to better quantification of the atmospheric component of fire risk. This helps land managers allocate resources more efficiently for fire planning purposes. Secondly, this work provides the potential for long-range predictability of climate conditions conducive to fire activity. If episodes of dry lightning can be linked to synoptic patterns, the potential exists to relate these patterns to longer-term global patterns such as the El Nino-Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO). This would provide an increased capability for generating seasonal-scale forecasts of fire risk.

For More Information About This Project

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About FIREHouse

FIREHouse is a collaboration between the Fire and Environmental Research Applications Team (FERA) of the USDA Forest Service Pacific Northwest Research Station, Pacific Wildland Fire Sciences Laboratory; the University of Washington; the National Park Service; the Bureau of Land Management – Alaska Fire Service; the US Fish and Wildlife Service; and the National Biological Information Infrastructure (NBII). Funding for FIREHouse has been provided by the Joint Fire Science Program (JFSP) and NBII. FIREHouse is coordinating efforts with the Fire Research and Management Exchange System (FRAMES) project team. Content on FIREHouse will provide substantial contributions to the FRAMES Northwest and Alaska Geo Portals.

For More Information about the FIREHouse Project

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